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Proceedings of the Fall Groundfish Stock Assessment Meetings Regional Advisory Process Maritimes Region

9-10 October 2001
24 October 2001
31 October-2 November 2001

Dartmouth, Nova Scotia

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Foreword

The purpose of this proceedings is to archive the activities and discussions of the meeting, including research recommendations, uncertainties, and to provide a place to formally archive official minority opinions. As such, interpretations and opinions presented in this report may be factually incorrect or mis-leading, but are included to record as faithfully as possible what transpired at the meeting. No statements are to be taken as reflecting the consensus of the meeting unless they are clearly identified as such. Moreover, additional information and further review may result in a change of decision where tentative agreement had been reached

Avant-propos

Le présent compte rendu fait état des activités et des discussions qui ont eu lieu à la réunion, notamment en ce qui concerne les recommandations de recherche et les incertitudes; il sert aussi à consigner en bonne et due forme les opinions minoritaires officielles. Les interprétations et opinions qui y sont présentées peuvent être incorrectes sur le plan des faits ou trompeuses, mais elles sont intégrées au document pour que celui-ci reflète le plus fidèlement possible ce qui s'est dit à la réunion. Aucune déclaration ne doit être considérée comme une expression du consensus des participants, sauf s'il est clairement indiqué qu'elle l'est effectivement. En outre, des renseignements supplémentaires et un plus ample examen peuvent avoir pour effet de modifier une décision qui avait fait l'objet d'un accord préliminaire

Table of Contents

Abstract / Résumé 4

Introduction 5

Environmental Conditions on the Scotian Shelf 6

4TVW Haddock 7

4Vn Cod 14

Scotian Shelf Southern Grand Banks Halibut (4VWX3NOPs) 18

White Hake in 4VWX and 5 22

Chairman's Remarks 28

Appendix 1. List of Participants 30

Appendix 2. Letter of Invitation to Prospective Industry Participants 32

Appendix 3. Meeting Agendas and Schedules 33

Appendix 4. List of Documents Tabled 36

Appendix 5. List of Recommendations from RAP and the AWG 37

ABSTRACT

A total of three Maritimes Regional Advisory Process (RAP) meetings were held in the fall of 2001 to consider stock status evaluations of 4Vn cod, 4VW haddock, 4VWX3NOPs halibut and 4VWX5 white hake. Input data was reviewed at a meeting on 9-10 October, population analyses were reviewed at a meeting on 24 October, and the results were synthesized into an overall stock outlook on 31 October-2 November. Stock Status Reports were approved for each of the stocks, all of which included Traffic Light indicators as a means of summarizing and highlighting multiple indicators of stock status. In preparation for the discussion of stock assessment analyses, recent oceanographic conditions were reviewed. These Proceedings record the main points raised during meeting discussions and provide recommendations for future work. Since the Proceedings were intended to document discussions and minority opinions at all stages of analysis, they should not be viewed as superceding in any way the conclusions documented in the relevant Stock Status Reports.

RÉSUMÉ

Trois réunions publiques du Processus consultatif régional (PCR) des provinces Maritimes visant à examiner les évaluations de l'état des stocks de morue de 4Vn, d'aiglefin de 4VW, de flétan de 4VWX3NOPs et de merluche blanche de 4VWX5 ont eu lieu en automne 2001. Les données d'entrée ont été examinées lors d'une réunion tenue les 9 et 10 octobre, les analyses de population ont été examinées à une autre réunion le 24 octobre et on a procédé à la synthèse des résultats sous forme de perspectives générales concernant ces stocks du 31 octobre au 2 novembre. Des Rapports sur l'état des stocks, comprenant tous des indicateurs de feux de circulation résumant et mettant en évidence les multiples indicateurs de l'état des stocks, ont été approuvés pour chacun des stocks considérés. En préparation pour la discussion sur les analyses d'évaluation des stocks, on a examiné les conditions océanographiques récentes. Le présent compte rendu fait état des principaux points soulevés durant les discussions et il contient des recommandations de travaux futurs. Comme ce compte rendu visait à documenter la discussion et les opinions minoritaires à tous les stades de l'analyse, il ne devrait pas être considéré comme un document qui supplante en quoi que ce soit les conclusions documentées dans les Rapports sur l'état des stocks.

INTRODUCTION

The Maritimes Regional Advisory Process (RAP) for groundfish stocks on the Scotian Shelf met three times in the fall of 2001 to review new groundfish stock assessments. The first meeting was held 9-10 October at the Lord Nelson Hotel in Halifax. This meeting focused on the input data for the stock assessments, including description of the fishery, catch, surveys (both DFO and industry), sampling and catch at age. A second meeting was held 22 October at the Bedford Institute of Oceanography to review the technical analyses applied to the various data such as Virtual Population Analyses, growth curve analyses and mortality estimation. The final meeting was held 31 October – 2 November at the Holiday Inn Harbourview in Dartmouth. This meeting built on the results of the first .wo meetings and developed the conclusions on stock status and outlook. The traffic light approach was used to assist in the summary of stock status for each stock. The multiple meeting format represented a change from that of previous RAP meetings, with the intent being to maximize outside consultation and minimize time spent by assessment staff. The extent to which these goals were met are addressed in the section entitled *Chairman's Remarks*.

The meeting format consisted of presentations of working papers, followed by review of the material, and discussion and agreement on the relevant sections of the Stock Status Report (SSR). At each meeting, the issues discussed and agreed-to at previous meetings were not debated further. Rapporteurs were appointed for each session.

Full stock assessments were presented for 4VWX5 white hake, 4TVW haddock, 4Vn cod and 4VWX3NOPs Atlantic halibut. All full assessments were considered within a traffic light framework. In addition to stock status evaluations, documents tabled at the meeting included an environmental overview and an update document providing the most recent information available for the other, unreviewed stocks. Titles and authors of all working papers are presented in Appendix 4.

Participants included representatives of DFO Science Branch, DFO Resource Management, provincial governments, FRCC, the fishing industry and non-governmental organizations. A list of participants is provided in Appendix 1 and the letter of invitation in Appendix 2.

The agenda for each of the meetings is provided in Appendix 3.

Research recommendations made during the meeting or by the Stock Assessment Working Group are summarized in Appendix 5.

As has been done in previous years, preliminary working papers were reviewed at multiple stages of preparation by the BIO Stock Assessment Working Group. The Proceedings of the Working Group meetings are available separately.

ENVIRONMENTAL CONDITIONS ON THE SCOTIAN SHELF

Working Paper: Drinkwater, K.F., B. Petrie, R.G. Pettipas, and V. Soukhovstev. 2001. Physical oceanographic conditions on the Scotian Shelf and in the Gulf of maine during 2000. CSAS Res. Doc. 2001/055.

Rapporteur: Ken Drinkwater

Annual mean air temperatures throughout most of the northwest Atlantic including the Scotian Shelf were warmer than normal in 2000, although they declined relative to the record setting temperatures of 1999. Consequently, sea-surface temperatures throughout eastern Canadian waters were also warmer-than-normal. Due to the warmer air temperatures less ice formed resulting in little to no ice reaching the Scotian Shelf in 2000 and much less ice coverage than usual in Sydney Bight. Subsurface temperatures in the northeastern portions of the Scotian Shelf continued their warming trend, were above normal for the second consecutive year and rose slightly relative to 1999. This followed nearly 15 years of below normal temperatures with the minimal temperatures recorded in the early to mid-1990s. Waters in the deep basins both on the Shelf and in the Gulf of Maine indicate continuance of the warm conditions re-established in 1999 after the cold water event of 1998. Near-bottom temperatures throughout the Scotian Shelf were also above normal in 2000 and the area of bottom covered by cold temperatures (<4°C) during the annual groundfish survey decreased significantly. The cold intermediate layer waters emulating from the Gulf of St. Lawrence also were warmer-than-usual. Warm Slope Water was located offshore and there was no evidence of Cold Slope Water along the Scotian Shelf or off the Gulf of Maine during 2000. While the vertical stratification in the upper water column (between surface and 50 m) over the Scotian Shelf generally weakened in 2000 relative to 1999, it remained higher-than-normal.

The available data for 2001 indicate that surface waters in the northeastern Scotian Shelf continue to be above normal by typically 1°-2°C but in the southwest temperatures were that much below normal. Near-bottom temperatures during the July groundfish survey cooled significantly from 2000 to 2001 leading to near normal or slightly below normal temperatures throughout most of the Shelf region. Other fisheries surveys, oceanographic monitoring stations and field studies provide further evidence of cooling over most of the Scotian Shelf from 2000 to 2001.

4TVW HADDOCK

Working Paper: Frank, K.T., and J.E. Simon. 2001. Assessment of status of 4TVW haddock: 2000. (2 parts). RAP Working Paper 2001/68.

Rapporteur: Peter Hurley

The Fishery

There was a question on whether the landings data included Sentinel and RV survey catches. Landings from Sentinel surveys are included in reported landings, but RV survey catches are not. Sentinel survey landings are shown in a text table in the WP. There was also a question on whether haddock bycatch from the scallop fishery were presented. These data were reported previously in the Res Doc on the Closed Area. Most of the scallop effort in recent years has been in the east of the closed area. Bycatches were small, maximum of 2t, usually in the order of 0.3t. In response to the question, it was indicated that all reported haddock bycatches from all invertebrate fisheries are included in the miscellaneous gear category. These data are obtained from reported landings in logbooks through the ZIFF data. There was a further question about the area covered by the scallop fishery. It was indicated that there was little effort on Emerald, mostly in the east of the closed area. It was observed that the impact of the scallop fishery was likely more on the bottom, and haddock "fodder". It was observed that the landings data with incorrect position data are less than 0.2% of total landings, reflect data quality, and are not a concern. It was also observed that there is no foreign catch in recent years, since the foreign allocation has been taken by Canadian vessels.

Commercial Catch at age

There was a question whether there were sufficient differences between 4V and 4W to warrant separate age-length keys. This had been looked at in an FOC meeting and differences were small enough that they could be aggregated, but this was how the catch-at-age had been constructed. There was a question about the reason for differences between the old and new catch-at-age. It was indicated that there had been insufficient time to re-age the 1985-89 commercial samples, and age-length keys from the RV survey had been used to construct the catch-at-age for that period. There was a question concerning the 1989 catch-at-age presented earlier to the AWG. That catch-at-age construction had used reported NAFO data for the foreign catch, which appeared to be wrong; Canadian observer data was used in this analysis back to 1985. There was a question whether we could recommend that NAFO change their data, but it was concluded that there should be a footnote in the Res Doc to explain what was done.

Sentinel Survey

It was observed that the distribution of Sentinel survey haddock catches differed from the distribution of haddock bycatches in the post-closure fishery and that these needed to be examined in more detail to determine if they were a result of seasonal differences in

availability. The absence of catches on the eastern shelf was of particular concern. It was noted that the July RV survey 30+cm distributions were similar to those of the Sentinel survey and that haddock bycatches in the post-closure fishery occurred largely where haddock were not concentrated.

July RV Survey

It was observed that the analysis focussed on the recent period but that there might be insights gained by examining the historical period as well. There was a question about interpretation of the abrupt increase in survey catches following the low 1970-75 period. This increase resulted from several good year-classes at a time when growth was high, together with removal of foreign effort. It was observed that the 50% decrease in 2001 42+cm catch rate was biologically implausible and there was a question whether there was independent information to judge if the 2000 point was high or the 2001 point was low. It was noted that Sentinel catches have been dropping steadily and that the abundant 1988 year-class was gone. It was concluded that the 2000 point was high. There was a question about the abrupt drop in catch rates in 1991. It was observed that the 1991 point was a year effect and that survey results were more variable when population abundance was high and flat when abundance was low. It was suggested that perhaps population abundance had increased sufficiently in recent years that variability in the survey was increasing. There was a question about survey catches close to the 4W/4X line and whether there was a continuum across the line. It was observed that industry saw much smaller haddock in eastern 4X, more similar to haddock in 4W. It was observed that while RV size-at-age was smaller in eastern 4X, it was typically larger than in 4W, and wouldn't imply movement from 4X to 4W. It was indicated that there were catches of haddock in the fishery in 4T close to the 4Vn line last year and that haddock catches were up again this year in the area, but that there was no size to these fish. There was the observation that had been good catches of 0-group haddock in the research vessel survey on the southern Grand Banks in 1998 and the source of this production was questioned; whether this was local production or a stock component that we normally didn't see. It was observed that 10-15 inch haddock had been abundant inshore in 4X last year but that there were none inshore this year when water temperatures were 43°F and it was suggested that water temperatures were shifting the distribution to the east. It was observed that Figure 14 indicated that the size distribution was filling in. There was some discussion of spatial indicators. It was observed that the rate of decrease in resource concentration slowed coincident with implementation of the closed area and then increased after closure of the fishery while CPUE where present increased coincident with the closed area and the rate of increase was higher after closure of the fishery. It was observed that the decrease in condition was more extreme in 4VW haddock than in 4VsW cod and that recent low condition was a common feature on the eastern shelf.

Spring RV Survey

It was observed that the female maturity-at-length in Figure 25 was grouped into time blocks but that annual estimates would be useful. It was indicated that this had been done

but was not available when the document was produced. There was a steady decline in length at 50% maturity from 40cm in 1979 to approximately 30cm in 2000; however this is confounded with changes in growth over this period and time to maturity may have remained the same. The spring survey otoliths have not been aged but this is a research project. It was suggested that the trend in length at maturity should appear in the SSR. It was indicated that a similar decrease in size at maturity had been observed in 5Z haddock and there was question whether these trends had been observed in other stocks. There was a comment that these trends had been observed in many stocks worldwide and the implications were alarming. There was some discussion whether these trends were a result of size selectivity of fishing gears, but it was suggested that it was premature to reach that conclusion.

It was suggested that the correlations in year-class indices be checked for time trends. It was observed that the correlations were often stronger two years later, suggesting a smearing of year-classes.

It was observed that the total mortality estimates after the fishery closure suggested that natural mortality during the period was greater than 0.2, as was seen in 4Vn and 4VsW cod. There was a question whether the estimates of Z would be used in the analysis and it was suggested that both 0.2 and values implied by the Z estimates be used to examine sensitivity to varying M.

Concern was expressed with the observation that size-at-ages 1-3 did not show the time trends evident at older ages, as these ages are not fully recruited to the RV gear and estimates of size would be biased by selectivity to the gear.

Rapporteur: Scott Wilson

Model Formulation

- BO'B – Why do Q values (p.5) double between ages 6-7-8?
- BO'B – Reason for ramping? Ans: .35 estimated in closed fishery & growth dynamic are different from prior years. Extended mortality back to time when size at age dropped.
- JN – Wants to see Zs from Survey of catch at age (p.3 of SSR)
- PF – Explanation of Alan's use of stepped mortality?
- MO'C – Why use of Sentinel Survey?
- BO'B – Retrospective pattern – does commercial 85-89 ageing account for changes?

Model Output

- BO'B – p.10 – What is comparison with Robin Mahon's work. Can you extend back to '48? Put output in historical perspective.
- SC – p.11 – Comparison of VPA & RV. Reason for differences.
- MO'C - Adjustment. for fishable biomass is based on 42cm. Why use this instead of age 4?

- JN – p.7 – Residual plot – Explanation of negative residuals 1990-1994, then switch to positive?
- BO'B – p.13 - Explanation of differences between VPA & RV lines from 1990s on?
- BM – Same picture on p.7
- BO'B – Weights seem to fit better than numbers
- BO'B – Overall trend last page since 1970 – Decline in exploitation rate from 1970-1996
- JN – p.8 – Retro pattern – Data added recently to model has resulted in major changes in mortality pattern. Are there independent measures to compare to show reality of this?
- SC – Fishery stopped in '93. VPA since runs on actual mortality. How long can VPA continue w/o catch?
- BM – Qs remain stable so survey indices can still be scaled to tonnage, but with some uncertainty about recent years.
- RH – Analysis is weakened by loss of recent catch.
- SC – p.14 – Diff. In growth rate , change in size at age. Does model pick this up? What effect does change in size at age have on biomass trajectory?
- RH – Fishable biomass. MO'C mentioned use of 42cm size. Size limits have varied by time and area. Has no biological basis.
- MO'C – Concept of 50% mortality?
- KF – Use of small fish protocol is justification
- MF – Ramp is over 4 year period. Would spreading it out over time improve the fit of the model?

Rapporteur: Diane Beanlands

Synthesis

Input Parameters and Technical review have been completed. A short review of these including an overview of the current fishing effort, description of the fixed gear sentinel survey, RV input parameters and SPA results were presented.

Question: Industry asked about presenting fishable biomass as > 42 cm rather than using the traditional 5+ group.
Answer: We know the maturity schedule for this stock has changed. A 42 cm is now an age 7 fish and it used to be age 5. Anything under 42 cm has always been considered as undersized under the small fish protocols.
Question: Industry still feels the age 5+ biomass is a better representation of the stock - closer to the long term mean.
Answer: 4VW haddock are hardly reach 42 cm any more but they do get to be 5 yrs old. But they're just not adding to the production. The 5+ scenario is in the res. doc. and is slightly below the long term average. Likely because the reduction in age at maturity has been compensated for by increase in SSB. Underlying environmental factors are favouring the survival of the young of these undersized, early maturing, haddock.

Traffic Lights

A brief explanation of the indicators used and their thresholds was presented.

Characteristics:

Abundance:

1 - Summer RV #/tow(>42cm): The red threshold associated with 2 historical low points (early 70s and 90s) The green associated with peaks in the 1980s
2 - Summer RV #/tow (26-41 cm): Cut points chosen to reflect highest values.
3 - Sentinel Survey (6 years of data) This was initiated when the stock collapsed so didn't set green to the highest catch rate. Put it just below.
4 - SSB: Green was set to coincide with the peak in abundance. (Used historical data - roughly 60,000 commonly caught)
5 - Area Occupied (30cm+): Cut points selected on the basis of which were highest and lowest in series. No preconceived ideas of what this means other than the stock is widely distributed at its peak abundance. Given weight of 1.
6 - Density: Cut points were given a weight of .5. The density does not seem to be responsive to abundance of the stock.
Discussion: In White Hake, density was dismissed as it was too highly correlated with abundance. Here it seems they are poorly correlated and we only giving a .5 weighting. The relationship was found to not be linear - the regression was not robust enough to look at the correlation. It does appear that haddock spread out more at periods of high abundance.
Decision: full weighting (1) given to Density.

Production:

1 - Recruitment: Green captures the highest values observed. Red is associated with the lowest observations. Full weight given (1).
2 - Area Occupied (1 - 29cm): Green captures an increasing trend in the last few years to expand to outside the closed areas. Full weight of 1.
3 - Density - Local density is increasing (particularly in the last 3 yrs). Cut points associated with the highest and lowest observations. Initially weighted at .5 but given the discussion on density under "Abundance", will change the weighting to 1.
4 - Summer RV growth - cut points assigned using highest and lowest values observed.
5 - Summer RV condition: Green light associated with the above average weight during the 70s and early 80s. Red was associated with low values in the mid 80s and 90s. We don't know enough about what this means. We believe that being underweight is probably not good. Weight is given .5 because of this uncertainty.
6 - Spring RV condition - weighted at .5 for same reason as above.
7 - Spring RV 50% maturity: cut points for green assigned highest values of size at maturity and red assigned the lowest. Larger size means better fecundity, more eggs with better quality. This was given full weight (1) as we know a lot about this indicator and what it means.

Mortality:

1 - Fishing Mortality: Based on exploitation rate on age 5 to 10 years olds. Green was assigned historical value of 20% (F0.1) and green was assigned twice F0.1.
Question: Why is exploitation rate not on 2001?
Answer: It's not a completed year. Adding it in as green will not change the overall appearance of the other indicators.
Decision: Add 2001 Exploitation value as green.

General Discussion:

Question: Industry wondered why the *VPA SSB* was shown historically back to 1945 but the rest of the indicators are to 1970. Is 1945 a reasonable perspective?
Answer: This is not unreasonable. It was reviewed at the technical meeting and captures the high points in the mid 80s as well.
Discussion: Industry concerned with the threshold of 60000 tons for SSB. When asked where it should be, it was felt that it was just generally too high. Science indicated the green is set so high to show us where it was and where we should be aiming. Industry expressed concern that yellow would indicate a change in different harvesting levels. Science indicated that pure red is when there should be real cause for concern. Values at 50, 55 and 57 were looked at. Overall appearance of the characteristic did not change.
Decision: VPA, SSB cut point for green set at 50,000 tons.

Question: The weighting of 1 for *Spring RV 50%* mature was questioned. Despite runs of red, there is some recent good recruitment. And there appears to be a weak relationship between size at maturity and recruitment at age 1.
Answer: Environmental conditions are good and temperature changes correspond very well with what's happening to the stock.
Discussion: Studies showing low body weight correlated with poor fecundity etc are from lab based studies of cod. It may not be applicable here. The traffic table though is designed to allow information to be used without having to explain it. A suggestion to build in some yellow since we don't really know what this indicator means was felt to be inappropriate. Why down weight an indicator because we don't know it as well as Ones we have studied for years.
Decision: Spring RV 50% mature will assign red, the lowest observed and green, the highest observed. Weight remains at 1.

Question: Why are *Spring and RV condition* only weighted at .5
Discussion: They provide one of the best examples of a clear trend that we have. Should have full weight. Are we double counting when using both surveys? These are two independent surveys measuring condition at different times of the year and should be fully weighted.
Decision: Spring and Summer RV condition are fully weighted.

Recommendation: This is not a precedent for other stocks. Where surveys are independent and where they are not should be fully explored on a stock by stock basis.

Question: Industry asked if the *Summer RV #/tow* for 42 cm can be down weighted due to its position in the biomass? Feeling by Science was that giving it full weight demonstrates that there is something wrong here. We need to keep track of the fact that this population has no decent size fish in it. Fish 42cm+ are also contributing the most to egg production so don't want to down weight that.
Decision: Full weight of 1 kept.

Question: Industry asked if giving full weight to the *Sentinel (kg/set)* is appropriate with only 6 years of data. Science replied that when weighting an indicator with a short time series, red is set at lowest observed and yellow is set at just below the highest observed. Green is not really set when we don't know what the best could be with only a 5 year time series.
Decision: Weight remains at 1.

Question: Should *Summer RV #/tow (26-41cm)* be in production rather than abundance? Most of that size range should still be in pre-recruit stage.
Answer: Fish between 30 and 40 cm are already entering the spawning stock.
Decision: Summer RV #/tow remain as an abundance characteristic.

Question: Why is there no RV recruitment - only a *VPA recruitment*?
Answer: Because the VPA is so closely correlated with the RV.
Discussion: Could have used age 1 recruitment estimates. Yes, but the 1998 year-class won't look strong as it fails to look at the age 2s in 2000. Should have both sources of recruitment.
Decision: Add RV recruitment <26 cm as an indicator of production.

Comment by industry that there is the appearance that there is still a lot of work to do on the traffic light approach - particularly on establishing appropriate the cut points and how to deal with the indicators. It still looks like the data is being massaged to come to a pre determined colour. Science commented that the Traffic Light approach allows us to spend more time and effort looking at information other than the traditional SPA products.

4Vn COD

Working Paper: Mohn, R.K., D. Beanlands, G.A.P. Black, and T. Lambert. 2001. Assessment of status of 4Vn cod: 2000. (2 parts). RAP Working Paper 2001/70.

Rapporteur: P. Fanning

The Fishery

The closure of cod fishery in 1993 caused a change in the spatial pattern of the fishery (fig 3).

The catch per unit effort (CPUE) since the closure needs to be looked at with respect to temperature changes. Especially in recent years the catch rates are distributed in areas and depths not previously fished.

The catch at age for all years differs from previous documents as there were changes in the available data. The present catch at age is explained in detail to provide a record for future use.

Surveys

The Commercial Index (CI) component of the Sentinel Program has been delayed in 2001 and there was concern that it had been cancelled. In the last three years it has moved into the deeper outside area of the Laurentian Channel which is not covered by the rest of the Sentinel Program. If it were discontinued there would be a change in the information available from this year on. Fishermen agree that there is less fish inside than outside, but the abundance of fish in the 'outside' area was greater than even in the 1980s.

There is a lot of variability in the CI data. The CI protocol and effort has changed from year to year. In 1996 there are only 10 sets in the CI and the estimate is unreliable. The point of the CI is to show that commercial catch rates have been about 3 times higher than the stratified random Sentinel Survey (SS) but the time trend is difficult to interpret because of changes in protocol, gear and fishing effort. The relatively low catch rate of the SS may be due to the design which randomly places sets in shoal water or on poor bottom in a constant proportion. As a result the average will be lower than would be possible but the time trend will be unaffected and all areas are monitored, even if there is little expectation of fish being caught in some areas.

The mode in SS size composition never moves suggesting that hook and line selectivity does not allow detection of large cohorts when they are young. The Research Vessel (RV) survey has not detected any good recruitment in recent years but close to constant low recruitment. The RV survey never showed very many large fish i.e. >75cm. but there are even fewer of them than before.

Industry raised concerns about the RV catchability below 100 fm depth. The mismatch in depth of best catch rates between the CI and the RV seemed to show this and further analysis of the impact was requested.

Mortality, etc.

Stock mixing with adjacent stocks (4T and 4VsW) is still occurring and may be important. There are no results to determine whether mixing rates have changed over time.

Mortality estimates are very high in the late 80s corresponding to the high catches at the same time. Seismic testing was also active at that time and may be a factor. Seal predation also needs to be considered especially if they are "belly feeding" routinely as this would not be detected by current estimation methods (scat or stomach sampling). Seals definitely feed on caught fish on longlines and leave the heads. There is consistent agreement that seals are a factor amongst industry and the intent is to include some estimation of seal predation in the model.

Rapporteur: Mark Fowler

Weighing the Merit of Summer RV and Fall Sentinel Surveys as Indicators of Abundance

The WG is concerned about the large difference in depth distribution between the July RV Survey and the Sept-Oct Sentinel Survey Commercial Index for 4Vn cod. The RV distribution is concentrated much shallower than the CI. The difference in timing might be responsible, the cod having descended to more of a winter depth regime by September. But summer and fall depth distributions of the adjacent 4Vs cod stock are similar. The realized sampling area of the CI is much smaller than that of the RV, such that the depth distributions might be a facsimile of geographic differences in sampling depths.

Steve asserted that the migration of 4T cod into 4Vn waters was already well under way in September (peaking in October), which would compromise estimates from the Sentinel Survey. This information has not made it to the literature yet, but information will be assembled information such as in-review/press drafts for the next meeting. The possibility that the 4Vn Sentinel Survey is catching 4T cod will have to be addressed.

The WG reached consensus that the summer RV is likely a more reliable indicator of 4Vn cod abundance than the fall Sentinel Survey.

Discussing the Natural Mortality Scheme Applied in the Latest VPA Formulation

A gradual increase in M from 1988 is applied to ages 1-5 to reflect predation on smaller fish by the growing grey seal population. A sharply ramped 1990-1993 increase in M for ages 6+ reflects our belief that changes in water temperature during this period affected survivorship and growth of larger fish. This could be due to decline in length at maturity coupled with decreased survivorship of mature fish. It was emphasized that we know that

something happened to increase M, and that the impact was greater on larger fish, but that we are not sure what mechanisms are involved. A gradual increase in M post-1993 for ages 6+ reflects our view on seal predation, and is of lesser slope than ages 1-5 to reflect our belief that larger fish are less susceptible to seal predation than smaller fish. There was some discussion about other sources of M that might exhibit changes over time to produce similar patterns to that proposed. Changes in migratory timing or non-recurring movements to depart habitats that became unsuitable (i.e. ocean climate influences on stock distribution confounding the M estimates) were considered explicitly, plus there would be others not explored. During subsequent review of the SSR it became evident that we needed to clarify our impressions of M, explicitly describing what assumptions were applied in the VPA while reminding the reader that other sources of M might be involved, and that the pattern is not rigorously determined.

Reviewing Model Results

Similar 'big picture' results were obtained whether M was ramped steeply or gradually, and the retrospective pattern was similar. These background observations should be mentioned in the SSR to allay concerns over the affect of M on VPA results. Emphasize that the current model does not change the overall interpretation of stock status relative to other models, but provides a better fit with respect to recruitment and retrospective patterns.

The possible reasons for the bifurcation in the retrospective pattern was speculated, just as was seen with 4VW haddock. We considered the possibility of misreporting since the closure, but felt it was unlikely to have been a problem in 4Vn due to intensive DMP on a small fishery.

The utility of the Sentinel Survey to tune the VPA was questioned, given so little apparent affect. But it pulls the Fs down to more reasonable levels in recent years.

Why is it is impossible to re-age the pre-1981 catch?

Rapporteur: Jim Simon

R. Mohn presented the summarised results of stock status of 4Vn cod from the first two public meetings that were held. This summary included slides on the commercial fishery, research vessel surveys and different aspects of the sentinel program in 4Vn. The changes in the SPA from the previous assessment were also provided.

New information and clarification on some points from the previous public meetings were presented on an environmental indicator, seal satellite tagging and depth distribution of the stock.

Questions from the floor on the presentation covered a range of topics. The differences noted in an earlier meeting, between the depth distribution in the research vessel survey catch rate and the commercial index fishery were discovered to be a data conversion

problem (fathoms/meters). There was an observation that biomass was continuing to drop without any substantial fishing pressure. The question was raised whether a maturity ogive was used to help explain this paradox. It appears that there are fewer fish and more are spawning. The big differences in the year to year residuals were noted. This was explained to be due, in part, to the low level of sampling in 4Vn by the research vessel survey. The fishing industry had previously expressed their viewpoint that seals were a problem in 4Vn. The map presented did not appear to support this argument, but it was suggested that many of the observed seals were probably young of the year that stayed closer to shore. It was also stated that the seals in 4T would have had to transit 4Vn to get there. The possibility that there were some seal/ice interactions that may have forced fish deeper in the 1980s when ice was plentiful was raised as a possibility.

Traffic Lights

The traffic light methodology was then brought forward. In general for this stock the 1970s and 1990s were bad and were represented as a red light, while the 1980s were good and have a green light. The use of characteristics to wrap up various indicators of abundance, production, mortality and ecosystem was presented. The RV abundance indicator was shown to be red in recent years while the short time series sentinel survey was made more yellow to reflect the uncertainty in this indicator. Paul Fanning reminded the audience how the committee last year used weighting to combined indicators of different length, while this year a weighting of one was used before combining. Weight and growth of a fish were given a .5 weighting as both were thought to measure the same aspects of population dynamics.

At this point it was felt that a more basic explanation of traffic lights were needed. Various proponents of the traffic light approach then provided a general explanation of fuzzy logic, the colour schemes in the "pies", boundary limits, inclusion of indicators and weighting. Questions followed on weighting and their effect on the stability of the model, the rigidity of the model in the choice of indicators and the effect on our understanding of the stock by changing boundaries between colours. A question on the choice of boundaries was raised in relation to the series length. The dynamic range of an indicator might not be seen unless we look back further in time than the 32 years provided. Various options were discussed in relation to the colour boundaries. Another issue raised was what did a colour mean. It was suggested that yellow might mean that you could possibly reopen a fishery. A question was raised on why the traffic light summaries shown at last year's RAP were not provided. The reply was that the meeting felt that that had been an inappropriate step.

The chair asked if there was any disagreement on the inclusion of any of the indicators and there was none. An explanation of how the indicators were rolled up to the characteristic level was requested. The explanation on the roll up used was provided and a simple averaging of the indicators were requested for comparison. It was asked that integration of both methods should be provided later in the meeting. The author was able to dynamically provide the simple integration.

The individual indicators were then reviewed. A couple in indicators were moved into their appropriate characteristic. The inclusion of growth into production was questioned. It was felt that we would see the reason for its inclusion better in the haddock assessment tomorrow. The sentinel survey weighting was again questioned and the response was that the series measured real values and yellow best expressed the level of uncertainty. The weighting of area occupied in the adults and juveniles was also questioned and the response was the high level of abundance in the 1980s was not captured by these indicators. Boundary levels giving more green were adjusted on the recruitment indicator. It was felt by a participant that the label for the characteristic ecosystem was a misnomer in this assessment and it should be called environment since it only included area occupied of a specific temperature and this was agreed upon. The use of length at age as a good indicator was questioned. It was felt that it was an indicator of growth.

The structure of the outlook in the SSR was debated. It was suggested that there should be a paragraph on each indicator and a summary paragraph though it might not be necessary to speak to every indicator. A traffic light paragraph should also be included before the outlook to explain characteristics, boundaries and colours.

The terminal year in the production characteristic was not complete and it was felt that it shouldn't have as much implication on the stock status as abundance. It was asked that a separate section on, Sources of Uncertainty be added to the body document and this was agreed upon.

SCOTIAN SHELF SOUTHERN GRAND BANKS HALIBUT (4VWX3NOPs)

Working Paper: Zwanenburg, K.C.T., and S. Wilson. 2001. Scotian Shelf Southern Grand Banks halibut. (2 parts). RAP Working Paper 2001/71.

Rapporteur: Mark Showell

The Fishery

It was noted that catches for 3P had been reported as an aggregate, and the status of 3Pn was debated. This area is currently not included in the stock area and is essentially 'orphaned', as catches from this subdivision are not assigned to any stock. No data exist to support inclusion or exclusion, however, given the size and relatively small historical catches from the area, an administrative solution with an arbitrary assignment to one stock area or the other may be sufficient. A similar problem was noted for 4Vn.

The accuracy of landings from SA 3 in the early 1960s was questioned. Reported landings during this period were high, but may include turbot landings. This may also be a problem with landing statistics from SA 0, 1 & 2 for the same period.

Ecological Footprint

An analysis of bycatch in the halibut fishery from commercial landings where halibut was identified as the main species for the trip was presented. White hake, cod, and cusk were the most common bycatch species, but many others were present as well, highlighting the potential impact of this fishery on other species.

Discussion centred on interpretation of the analysis, in light of the current management scheme for halibut. Given that the majority of halibut is not landed in halibut directed trips, it was suggested that looking at main species halibut only may bias the results. However, it was noted that in the ZIF data set main species is assigned on a sub-trip basis, reducing the size of the problem. Questions were raised as to how an analysis of this type might be used as a tool for management, as situations might arise where a bycatch species was caught in one area but not another. To account for this, the analysis would have to be broken down by area, gear, etc. It was agreed that an illustrative example looking at hand line/longline gear in 4VW would be included in the SSR.

The observation was made that landings data may not include all species caught in the halibut fishery, as discarding of non-commercial species as likely. Observer data, especially the commercial index data set, may be better in this respect.

RV Survey

In recent years additional, deepwater strata have been sampled during the July RV survey. Halibut in these strata are larger, resulting in slightly higher biomass estimates when these strata are included. To maintain consistency in the time series from 1970, the deepwater strata were excluded from the calculation of mean number and biomass. However, it was agreed they should be included as a separate index on the same chart. It was suggested that a size comparison between halibut caught in the deep strata and those on the shelf be prepared, to strengthen the rationale for portraying the two series separately.

Indices of stock distribution were presented, with the mean of non-zero numbers and the proportion of the area with 75% of the numbers interpreted as density and breadth of distribution over the historical range, respectively. The sporadic catches of halibut typically seen in the July RV survey makes this data set a less than ideal candidate for distributional indices. It was also noted that the this survey only covers a portion of the stock area, and that the indices calculated from these data may not be representative. However, the survey does catch the smaller halibut, and may provide insight into the pre-recruit portion of the population.

For the index representing breadth of distribution, it was noted that the highest values are generally seen prior to 1982 when the research vessel changed. In addition, the number of number of sets for some areas have been increased over the time series, and were mentioned as possible sources of bias. However, these changes began in 1987 and are not coincident with the change in the distribution index.

Industry Survey

Catch rates for a fixed station survey and a commercial index fishery, standardized for hook number and soak time, were presented as indices of abundance. It was noted that the soak time adjustment had assumed a linear trend, while the data suggested an asymptotic relationship. This would result in an over correction for long soak times. However, the adjustment for soak time was noted to be small, and that interpretation of the results would not change.

In some years (1998, 2001) the commercial index portion of the survey was unable to sample stations in SA 3 due to zonal allocation issues. For consistency, it was suggested that SA 3 be excluded from the analysis.

Differences in size distribution were noted between years for both the fixed station and commercial index survey. In 1998 and 1999 a fairly steep 'shoulder' is seen at about 80 cm in both data sets, suggesting a sampling of gear effect. In the 2000 and 2001 results this abrupt change did not appear in the length frequencies.

Rapporteur: Ralph Halliday

Stock Structure

The Industry/DFO survey showed that there were differences in size structure of halibut by area, catch rates of smaller fish (<100 cm) being highest on the Scotian Shelf, particularly in Div. 4X, whereas there were higher catch rates of large fish in Div. 3NOP. This could be taken as support of the hypothesis that that there is a net migration of fish to the east with age. The extent and rate of this migration was debated. It was noted that data from tagging experiments, reviewed in earlier assessments, showed that young fish moved most but migration patterns are complex and still not well understood.

It was noted that Subdiv. 3Pn is not included in any management area and was being used as a loophole for misreporting. This Subdivision is nominally included in this assessment. It was pointed out that it is more likely to be included in the Div. 4RST management unit. This has no practical implications to the present assessment.

Research Vessel Surveys

It was agreed that the Scotian Shelf RV summer surveys provided so little information about the part of the population being fished (fish of 82+ cm) that it could not be used as an indicator of abundance for this portion of the population. It was considered useful as an indicator of the pre-recruit portion, however.

It was agreed to include the spatial distribution indicators 'area occupied' and 'density' as well as stratified mean numbers per tow as indicators of pre-recruit abundance. The

density indicator was accepted because it gave a clearly different signal from number per tow ($R^2 = 0.22$).

Industry/DFO Surveys

The importance of this survey was stressed. It is the only indicator of abundance of the fished part of the population and its continuation is essential to future assessments for halibut.

Obtaining adequate survey coverage in Subarea 3 has proved problematic. The survey has two parts, a fixed station component and a commercial fishing component, the latter generating most of the revenue that supports the survey overall. A requirement by Newfoundland Region for adherence to strict bycatch regulations for cod during the commercial component has been an impediment to completion of this part. This, in turn, has undermined the financial basis for all of the survey activities in Subarea 3.

It is **recommended** that given the survey coverage in Div. 3NOP is essential for assessment of halibut, all parties make every effort to resolving this financial problem by whatever method proves possible.

It was noted that the survey in Subarea 3 had not included in any year the eastern part of 3N. It was stated that commercial fishing in that area in the 1980s yielded lots of big halibut. It is not known what effect this lack of coverage may have on present survey results.

Long-Term Expectations

Landings of halibut from the late 1800s to present averaged about 2000t. This gives some rough perspective on the level of yields that might be possible from the resource. There have been periods when landings were higher, particularly in the 1950s and 60s when catches were about 4000t. The extremely high peaks in landings in occasional years are though to represent deficiencies in the statistical record. Current removals are about 1000t. Thus, while these are low, they are not highly restrictive in the context of this longer-term record.

Current Status

The Industry/DFO survey data show stability in stock size over the four years that survey has been conducted. However, how this stock size relates to historical levels is not known. An estimate of current mortality is needed before it will be possible to say whether present removals are consistent with a rebuilding strategy. Thus, bringing to completion current work on ageing was agreed to be the most important next step and was given every encouragement.

WHITE HAKE IN 4VWX AND 5

Working Paper: Bundy, A., M. Fowler, W. MacEachern, and P. Fanning. 2001. White hake. (2 parts). RAP Working Paper 2001/69.

Rapporteur: Jeff McRuer

The Fishery

Landings used in the assessment for this stock are from NAFO 4VWX and parts of 5Yb and 5Zjm/c as reported to NAFO since 1964. However, Canadian landings from 1986 to the present are from ZIF. Prior to 1986 Division 5 landings were from 5Yb and 5Zjm. In 1986 the Hague line was established and NAFO defined a new subarea 5Zc, made up of the parts of 5Zjm in Canadian waters and they moved the line defining 5Yb to correspond with the new boundary. Landings from Division 5 since 1986 are from these newly defined subareas.

There are some problems with the data. Prior to 1991 white hake were often reported with cusk and pollock under one of the species names. Therefore landings do not necessarily reflect the true, causing problems interpreting all three. Industry representatives also said that in 4X and 5Y there was a lot of mis-reporting from the early 1980s until 1989. The introduction of dockside monitoring after 1989 ended much of this practice.

Analysis of Species Composition

An Analysis of species with respect to catches of white hake showed that overall in 4VWX/5, 60 to 70% of white hake was landed as main species in the first half of the 1990s. Since 1995, this has declined to 33% The fishery has been a 'by-catch' fishery since it was recommended by the FRCC in 1999 with a CAP set by Fisheries Management. Community Management Boards work within the CAP and some issue white hake quota to fishermen creating 'directed' fisheries. Industry representatives commented that fishermen direct for white hake to ensure the quota CAP was reached. The target 'by-catch' for white hake is from 10% to 20% depending on gear, but it varies dramatically with gear and area with long liners in 4Vn at over 70 to 90%, mobile gear in 4X at 7% and gill nets at 30 to 60% in recent years. The question was raised whether subtrips used for this analysis really represent white hake trips and it was reported that results from a catch rate analysis indicated they were, particularly for longline gear.

The data indicated a high proportion of 'other' in 1986 and 1987 in 4Vn and 4W longline and 4W gill nets, after 1987, this category was much lower and consistent. Members at the meeting felt this might due to the closures and the practice of reporting a lot of fish as unspecified groundfish This was the practice in the mobile fleet until 1990 and with longliners and gillnets until 1993. The suggestion was made that the by-catch graphs should only include data from these dates to present.

Age Compositions of Landings

The analysis included all gear types together for all 4VWX/5 by year, but there was not much difference in the size of fish caught by each gear sector or year. Analysis is continuing to examine the age data in more detail, splitting it by gear type and area if the data allows.

Catch Rates

The first examination of catch rates for this stock was completed for the white hake assessment in 1998 using set by set data extracted directly from logbook records. In order to make this analysis easily replicable in subsequent years, the analysis was done using ZIF data reported by subtrips. Subtrips are the result of breaking fishing trips by day, unit area and gear type and can result in containing more than one set. The original data used in the 1998 study was recompiled standardized to subtrips and compared to those using ZIF data from 1991 to 1997. Both methods gave the virtually same results except for 1991 and 1994 where sparse data gave poor results. Based on this analysis ZIF data was used from 1998 to the present.

Predicted gear types in 4X and 5 look very similar and probably could be included into a GLIM to give a better fit to the model, however, by doing so the differences would be lost and the resulting fit would give the same interpretation. The catch rate tables presented are good but could be improve by including r^2 or the % explained.

The price of white hake has dropped from 60¢ in 1999 to 30¢ in 2001 which has changed the way in which fishermen conduct this fishery but price was not factored into the analysis because of a lack of trust for pricing data in ZIF.

During the review of the Stock Status Report there was discussion of whether catch rates should be treated as an indicator of abundance for this stock or just be reported in the fisheries section. Because it was calculated using indexed fishers, it was felt to be a reliable index and was used in the last assessment. It also agrees with other indices of abundance. Industry representatives pointed out that rules and regulations might influence it. They reported getting higher catch rates in recent years and catching their limit in a single set, and fishing other species for the remainder of the day. Because of this, the high catch rate is lost from the analysis, which uses the coarser unit of subtrips. It was acknowledged that this could be a problem and it would be revisited using set information, if possible, and reported at the next meeting.

Research Surveys Data

Towards the end of the discussion of RV data, the point was raised of how we report the information. Management units for the stock are 4Vn, 4VsW and 4X/5Zc and this stock was being examined using boundaries more reflecting their biology. The author felt this was the best way because different areas, such as 4Vs and 4W were doing different things. This question was addressed during the 1996 assessment and it was agreed to use

the more 'biological' approach. Stock structure is a question yet to be addressed fully and it was put forward as a **research recommendation** to examine stock structure and decide upon the best method for presenting advice for next years RAP.

Abundance Trends

The trawlable units vary in the tables for mean numbers and weights unlike data presented for other species. This is due to the method of extraction used which also calculated variance requiring more than one set per strata. Strata with only one set were dropped thus reducing the trawlable units used in the calculation.

In the 2001 RV survey a large number of fish between 30 and 45 cm appeared out of nowhere. There source is unknown but a comparison with the 4T Survey might be a good start. It was also suggested that future research might include whether 4T and 4Vn stocks should be considered together.

Condition Factor, Mean Weight and Mean Length

The condition factor for 45cm white hake has shown no trend throughout the series and remains close to the mean in all areas. The mean length and mean weight of RV catches in all areas except 4X have declined. It was postulated that temperature might be the cause, but this has not been investigated. Another possibility was as a result of reduced catches, however, throughout the 1990s there were no major changes in the RV catches.

Industry Survey Data

Distribution

- The Halibut Survey map (pg. 68) includes both commercial index and fixed station results and should be only the fixed station.

Length Composition

- The Halibut Survey length composition plot (pg. 68) has a poor scale and buries the details.

Length and Depth Relationship

The length and depth of capture was examined for 4VsW Sentinel and Halibut surveys and fish length was found to decrease with depth up to between 180 and 200 metres after which fish length increased with depth. This was true for both surveys and anecdotal information agreed with this finding. "Nash always said that the fish got smaller the deeper he fished" and the deepest he fished was 200 metres. Why this occurs is unknown and it was suggested that temperature should be examined as a cause.

Diet Analysis

White hake stomachs were systematically collected from the RV surveys in 1999 and 2000 and showed the largest proportion of the diet to be shrimp. The fish sampled, however, were generally smaller and may not represent the diet of larger hake, which might contain a larger proportion of fish. Industry representatives reported that large hake were like vacuum cleaners eating whatever was there, eg. pollock, silver hake.

Rapporteur: John Neilson

Growth and Mortality

Update to catch rates was presented. New effort of abundance was selected.

Main part of presentation dealt with age data, development of age length keys, growth rate determination and mortality estimation.

There was discussion of the commercial fishery catch rates, and the impact of standardization on the series. Only 4VsW is proposed as an index of abundance in the assessment. No assumption that that catch rate is applicable to the western Scotian Shelf. Potential problem with P. 10 noted – Mark to check. Later confirmed that two points appearing as zeroes should be blanks.

Question of length frequency compositions, how many fish were measured.

Question of combination of sexes leading to very large spread of length at ages was noted, and discussed. More data is required.

Fig. 5, P. 22, discrepancy between Georges Bank and the western 4X was noted.

Geographic basis for generation of keys was discussed. Individual keys do not support differences in 4X5. Alida noted that the split was somewhat arbitrary, other permutations possible. Combined on the basis of modal lengths. Further examination of area and sex-specific factors influencing growth was noted as a research recommendation. Absence of information from 4W was noted as a difficulty.

Otolith exchange with NMFS and DFO age readers was recommended, if it is not already in place.

Comment on the current commercial fishery distribution relative to the historic length composition was noted.

Combining several years for the construction of the age-length key was discussed, in light of recruitment variability. Alternative methods such as the Kimura-Chikuni approach was suggested.

Reductions in growth rates apparent for other stocks will not be apparent in this analyses. It was recommended to see if other collections of otolith exist during earlier periods.

Catch curve analyses are same data treated in different ways. It was recommended that we choose only one method of catch curve analyses for inclusion in the SSR. Given issues raised in growth models, are the calculations of Z appropriate? It was responded that perhaps the analysis gives overall relative trends.

Plot by area, showing all methods was recommended to assess differences (authors to provide this)

Conclusions regarding age determinations could be viewed as preliminary.

Relative Fs useful as trend, but not for absolute values. Estimates of Z derived from catch curve analyses much higher. No way to reconcile this information with catch curve analysis.

Annual catch curves can be confounded by year and cohort effects.

Suggestion to consider shorter term time series, say 10 year period.

Concluded to include Z calculations (annual catch curve Zs to be included), with caveats to reflect ageing uncertainties.

Discussion of SSR (substantive points only: editorials noted by the author)

Note to include distributional indices.

Need to include justification for which catch rate series included in Resource Status.

Need to correct von Bertalanffy growth curve figure.

Include only catch curve estimates for East and west (one page, ages 4-7 to be included).

Include relative F plot for three areas.

Rapporteur: Peter Comeau

Presentation

Input parameters and technical review had been completed in previous meetings. An overview to summarise the previous work was completed.

There were a number of comments on the temperature and prevalence analysis. There was a question regarding why the sentinel and halibut surveys were not used in the temperature/prevalence analysis? These survey series were not used because of the short time series.

It was questioned whether or not the two spatial indicators presented were both required. It was pointed out that with the density remaining relatively constant and the area occupied declining that this was indicating a decline in overall abundance. As a result these indicators were not really providing added value since it was already captured in the RV numbers indicators. Alida and Paul Fanning felt that the indicators were showing different patterns.

It was pointed out that <45cm numbers per tow were being used as a proxy for recruitment.

Traffic Light Analysis

It was pointed out that levels set as an upper threshold for <45cm RV numbers was not set at the highest levels because it was felt that the research vessel survey catches are an under representation of abundance.

It was questioned why there was a 2001 value for Relative fishing mortality. Alida pointed out that the 2001 fishery is almost complete and that even if the landings reach the cap the fishing mortality will remain low and not exceed the green threshold.

There was a discussion of whether or not the July survey mean weight should be included as an abundance or production indicator. It was recognised that the mean weight indicator is roughly the opposite of the RV numbers <45cm indicating that it is confounded by recruitment. Paul Fanning suggested that it was indicating a lack of larger fish more than it was showing an abundance of small fish. Therefore he felt it should remain as an abundance indicator. It was also felt that since white hake do not show the large recruitment pulses seen in species like haddock that it was best left as an abundance indicator. The final decision was that until such time as there is better ageing data this indicator would be used as an indicator of abundance.

It was felt that setting limits for the ITQ and halibut surveys might be premature and result in setting the wrong limits. The result of this is that if we wait for a longer time series we may actually find out that the current period could possibly all be green or all red. Alida indicated that both surveys are showing similar trends to the RV survey. Therefore she felt that there was some level of confidence in the limits. Paul indicated that based on the RV trend we could be rather certain that the red threshold is accurate but that perhaps the green is set low.

It was questioned why there are so many 0.5 weightings in the traffic light table. It was pointed out that 0.5 weightings are used for indirect estimates.

There was a discussion over the possibility of the 2001 value for the RV >45cm numbers being a year effect. It was suggested that perhaps since this was seen in all the surveys that it was looking as potentially a year effect. Alida indicated that the length analysis in

the working paper showed that a large pulse of fish actually increased in size between 2000 and 2001 and felt that the large increase in numbers larger than 45cm was real.

There was an extensive discussion over the two spatial indicators presented in the initial Traffic Light table. There was concern that since the RV Numbers >45cm and density appear to be highly correlated that density should be removed as an indicator. The discussion centred on when is it appropriate to use indicators which appear correlated and when not to. There was some concern that we may be throwing away useful information just because there is appearance of correlation between indicators. It was agreed that in the case of white hake that since the correlation was very high ($r>0.90$) and the indicators are derived from the same data that the density indicator would be dropped from this analysis.

It was pointed out during the discussion on spatial indicators that they seemed to be poorly understood. There was a research recommendation that the work on spatial indicators conducted by the Fisheries Management Working Group be expanded to better understand the interaction between the various spatial techniques. It was also suggested that this work be presented in a stand-alone publication rather than in the minutes of the Fisheries Management Working Group.

Following discussion during the 4Vn Cod presentation on methods to roll up the indicators into characteristics, there was extensive discussion during the white hake presentation on which technique (snap-to or a non-snap-to) approach should be used. After looking at the two methods it was decided that for white hake there was little difference between the two methods. However, the non-snap-to approach tended to give a more conservative picture and give a better indication as to how close the characteristic was to the red or green threshold. With the snap-to method it tended to be more definitive in telling where we stood in terms of stock health. It was felt that the snap-to method put more faith in the boundaries where as the non-snap-to method leaves a little more room for interpretation by the reader.

It was decided that the non-snap-to technique would be used to roll-up the characteristics. It was suggested that this was appropriate since this approach showed more detail and the outlook tended to put a definitive interpretation on the characteristics.

There was a **research recommendation** made that a more comprehensive evaluation of roll-up techniques be conducted.

CHAIRMAN'S REMARKS

The meeting was adjourned at 1400 hr on Friday 2nd November after the last SSR was approved. All SSRs were completed and reviewed successfully. In addition, considerable progress was made in preparing and evaluating the traffic lights for each stock, to the point where they finally appear capable of assisting in the development of an outlook of stock status. Such a development stands in stark contrast to the use of traffic lights in the

2000 RAP. Considerably more work is required to develop traffic light characteristics as summaries of groups of indicators, and to develop defensible cutpoints for the thresholds of individual indicators. Nevertheless the perception of traffic lights as a useful tool was evident in many RAP participants for the first time, albeit very modestly.

The 2001 RAP differed from that of previous years in that three shorter meetings were held, rather than one long one. This change was intended to maximize efficiency and save time, in part through the elimination of time-wasting re-openings of past discussions. However, it is not at all clear that this goal was met. At the final meeting, the process of presenting and discussing the draft SSR, rather than the working paper, was worthwhile and appeared to save time without stifling important discussion. However, the number of RAP and industry participation meetings prior to the final meeting was time consuming and not completely satisfactory. Perhaps only two RAP meetings would have sufficed: one dealing with input data and a final one dealing with analysis and synthesis. Ideally, the meeting dealing with input data could be carried out in conjunction with a meeting with industry, thus reducing the number of meetings required. A post-mortem of RAP participants is required to discuss these and other options, with the goal of maximizing industry input while at the same time minimizing the time required of assessment staff.

Appendix 1. List of Participants.

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Nash, Kevin	4Vn Sentinel Survey	(902)849-7043		pgk@fox.nstn.ca
Neilson, John	MFD/St. Andrews, NB	(506)529-8854	(506)529-4274	neilsonj@mar.dfo-mpo.gc.ca
Nelson, Jim	DFO/Dartmouth	(902)426-9850		nelsonj@mar.dfo-mpo.gc.ca
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Paul, Lisa	Eskasoni Fish and Wildlife Comm.	(902)379-2024	(902)379-2159	pla_mu@fox.nstn.ca
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Reardon, Clary	NS Fisheries	(902)424-0349		reardonc@gov.ns.ca
Saulnier, Hubert	MFU	(902)769-3348		capttiff@klls.com
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Walters, Evan	Barrington, NS	(902)637-3276	(902)637-3270	
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Appendix 2. Letter of Invitation to Prospective Industry Participants.

Marine Fish Division
Maritimes Region
Science Branch
(TEL: 902 426-4890)
(FAX: 902 426-1506)
(E-mail: farrellw@dfo-mpo.gc.ca)

Distribution

Subject: Maritimes Region RAP Meetings, Fall 2001

The Maritimes Regional Assessment Process for groundfish stocks on the Scotian Shelf will meet three times between now and the beginning of November. In response to difficulties and concerns raised by various participants regarding recent RAP meetings, the process has been improved this year. There will still be a total of five meeting days in the entire RAP, however they will be separated by intervals of time.

The first meeting (Oct 9-10) will focus on the input data for the stock assessments including description of the fishery, catch, surveys (both DFO and industry), sampling and catch at age (where available). The second meeting (Oct 22) will review the technical analyses applied to the various data such as virtual population analyses, growth curve analyses and mortality estimation. The final meeting (Nov 1-2) will summarize the results of the first two meetings and develop the conclusions on stock status and outlook. However, the issues discussed and agreed-to at previous meetings will not be debated further. Each meeting will review the material presented to it and finalise the sections of the Stock Status Report document relevant to the material. The intent is to complete the section by section reviews at each meeting and move on to new material at the next meeting.

In advance of the three review meetings, there will be industry meetings held in Yarmouth, Sheet Harbour and Cape Breton (time and place to be forwarded shortly). The purpose of these meetings will be to solicit industry input, comments and views on issues relevant to the assessment of the various groundfish stocks.

The schedule of meetings with the topics for review is attached.

If you plan to accept this invitation, please inform Wanda Farrell (ph: 902-426-4890: fax: 902 426-1506 or e-mail: farrellw@mar.dfo-mpo.gc.ca) at your earliest convenience.

Yours sincerely,

original signed by:

Steven Campana
Chairman

Attachment
cc: W. Stobo
P. Fanning
R. Stephenson
B. O'Boyle

Appendix 3. Meeting Agendas and Schedules.

Regional Advisory Process on Scotian Shelf Groundfish
Lord Nelson Hotel,
Halifax, Nova Scotia
9-10 October 2001

The Maritimes Regional Assessment Process for groundfish stocks on the Scotian Shelf will meet three times in the fall of 2001 to review new groundfish stock assessments. The first meeting (Oct 9-10) will focus on the input data for the stock assessments including description of the fishery, catch, surveys (both DFO and industry), sampling and catch at age (where available). The second meeting (Oct 22) will review the technical analyses applied to the various data such as virtual population analyses, growth curve analyses and mortality estimation. The final meeting (Nov 1-2) will build on the results of the first two meetings and develop the conclusions on stock status and outlook. However, the issues discussed and agreed-to at previous meetings will not be debated further. Each meeting will review the material presented to it and finalise the sections of the Stock Status Report document relevant to the material. The intent is to complete the section by section reviews at each meeting and move on to new material at the next meeting.

Full stock assessments are being conducted for **4VWX5 white hake, 4TVW haddock, 4Vn cod** and **Atlantic halibut**. An update document will also provide the most recent information available for other stocks, although they are not the subject of reviews this year. All new assessments will be considered within a traffic light framework.

The subject of the current meeting is **the review of the input data** for the stock assessments, including description of the fishery, catch, industry and DFO surveys, sampling, catch at age, stock structure, growth and the environment, as well as the preparation of the relevant sections of the Stock Status Report. Overall stock status will not be discussed at this meeting.

AGENDA

October 9

0900-0915	Overview of RAP process (Steve Campana)
0915-0945	Environmental overview (Ken Drinkwater)
0945-1200	4Vn Cod (Bob Mohn)
1200-1300	Lunch
1300-1700	Atlantic Halibut (Kees Zwanenburg)

October 10

0900-1200	4VW Haddock (Ken Frank)
1200-1300	Lunch
1300-1700	4VWX5 White Hake (Alida Bundy)

Appendix 3. (Continued)

Regional Advisory Process on Scotian Shelf Groundfish
Ocean Sciences Boardroom (VS 416) 0900-1200
Ron Trites Boardroom (4th Floor Polaris) 1300-1700
Bedford Institute of Oceanography, Dartmouth, Nova Scotia
24 October 2001

The Maritimes Regional Assessment Process for groundfish stocks on the Scotian Shelf will meet three times in the fall of 2001 to review new groundfish stock assessments. The first meeting (Oct 9-10) focused on the input data for the stock assessments including description of the fishery, catch, surveys (both DFO and industry), sampling and catch at age. The second meeting (Oct 24) will review the technical analyses applied to the various data such as virtual population analyses, growth curve analyses and mortality estimation. The final meeting (Oct 31-Nov 2) will build on the results of the first two meetings and develop the conclusions on stock status and outlook. However, the issues discussed and agreed-to at previous meetings will not be debated further. Each meeting will review the material presented to it and finalise the sections of the Stock Status Report document relevant to the material. The intent is to complete the section by section reviews at each meeting and move on to new material at the next meeting.

Full stock assessments are being conducted for **4VWX5 white hake, 4TVW haddock, 4Vn cod** and **Atlantic halibut**. An update document will also provide the most recent information available for other stocks, although they are not the subject of reviews this year. All new assessments will be considered within a traffic light framework.

The subject of the current meeting is **the technical review** for the stock assessments, including sequential population analyses, growth and mortality estimation, as well as the preparation of the relevant sections of the Stock Status Report. The Report sections for halibut agreed to at the last meeting will also be reviewed. Overall stock status will not be discussed at this meeting.

AGENDA

October 24

0900-1030	4VW Haddock
1030-1200	White hake
1200-1300	Lunch
1300-1430	4Vn Cod
1430-1700	Halibut

Appendix 3. (Continued)

Regional Advisory Process on Scotian Shelf Groundfish
Holiday Inn Harbourview, Dartmouth, Nova Scotia
31 October – 2 November 2001

The Maritimes Regional Assessment Process (RAP) is currently reviewing full stock assessments for **4VWX5 white hake, 4TVW haddock, 4Vn cod** and **Atlantic halibut**. RAP meetings to date have reviewed the input data and technical analyses for the four groundfish stocks. The subject of the current and final meeting is **the final review** for the stock assessments, including the conclusions and stock outlook, as well as the completion of the Stock Status Report. This final meeting will build on the results of the first two meetings and develop the conclusions on stock status and outlook. However, the sections of the Stock Status Report discussed and agreed-to at previous meetings will not be debated further. All new assessments will be considered within a traffic light framework.

An update document will be available at the meeting to provide the most recent information on other stocks, although they are not the subject of reviews this year.

AGENDA

October 31

0900-0915	Overview of RAP process (Steve Campana)
0915-1200	4Vn Cod (Bob Mohn)
1200-1300	Lunch
1300-1430	4Vn Cod (cont'd)
1430-1700	4VWX5 White Hake (Alida Bundy)

November 1

0900-1200	Atlantic halibut (Kees Zwanenburg)
1200-1300	Lunch
1300-1700	4VW Haddock (Ken Frank)

November 2

0900-1200	SSR revisions as required
1200-1300	Lunch
1300-1700	SSR revisions as required

Appendix 4. List of Documents Tabled.

Branton, R., and G. Black. 2001. 2001 summer groundfish survey update for selected Scotia-Fundy groundfish stocks. CSAS Working Paper.

Bundy, A., M. Fowler, W. MacEachern, and P. Fanning. 2001. White hake. (2 parts). RAP Working Paper 2001/69.

DFO, 2001. Updates on selected Scotian Shelf groundfish stocks in 2001. DFO Science Stock Status Report A3-xx (draft). [Not reviewed].

Drinkwater, K.F., B. Petrie, R. Pettipas, L. Petrie, and V. Soukhovstev. 2001. Physical oceanographic conditions on the Scotian Shelf and in the Gulf of Maine during 2000. CSAS Res. Doc. 2001/055.

Frank, K.T., and J.E. Simon. 2001. Assessment of status of 4TVW haddock: 2000. (2 parts). RAP Working Paper 2001/68.

Mohn, R.K., D. Beanlands, G.A.P. Black, and T. Lambert. 2001. Assessment of status of 4Vn cod: 2000. (2 parts). RAP Working Paper 2001/70.

Zwanenburg, K.C.T., and S. Wilson. 2001. Scotian Shelf Southern Grand Banks halibut. (2 parts). RAP Working Paper 2001/71.

Appendix 5. List of Recommendations from RAP and the AWG.

4Vn Cod

The AWG **recommends** that the age determination history for this stock be examined to determine if ageing errors have introduced an artifactual change in size at age. Comparative sectioning and ageing of pre- and post-1985 intact otoliths will be required.

4VW Haddock

The age bias between ager 1 and 2 may be due both to the very strong annulus (of the 1999 YC?) and possibly a wide edge. The AWG **recommends** action to resolve if year 2000 produced an anomalous growth zone, and which ager is interpreting correctly.

Atlantic Halibut

Given that survey coverage in Div. 3NOP is essential for assessment of halibut, it is **recommended** that all parties make every effort to resolving the financial problem associated with the full use of the halibut survey in 3NOP by whatever method proves possible.

The AWG **recommends** that the availability of NF RV data be explored.

White Hake

Management units for the white hake stock are 4Vn, 4VsW and 4X/5Zc, but these management units are not based on biology. The question of stock structure is a question yet to be addressed fully and it was put forward as a **research recommendation** to examine stock structure and decide upon the most appropriate assessment and management units to be used in the next RAP.

The geographic basis for the generation of age-length keys was discussed. Individual keys do not support differences within 4X5, and may suggest that pooling areas of 4X5 with 4VW is inappropriate. Further examination of the most appropriate aggregations of age-length keys by area and sex was **recommended**.

Otolith exchange with NMFS and DFO age readers was **recommended**, if it is not already in place.

Reductions in growth rate apparent for other stocks since 1986 will not be evident in analyses based on ageing of 1998-2000 samples. It was **recommended** that earlier collections of otoliths be located and aged, if possible.

Determine if sexually dimorphic growth is apparent in Scotian Shelf white hake, as is seen in 4T. If present, the AWG **recommends** that the use of sex-specific age-length keys be explored.

The AWG **recommends** that routine collection of white hake otoliths on summer RV surveys be initiated and maintained for at least 2 years, so as to provide ageing material from throughout the stock range.

Spatial Indices

It was pointed out during the discussion on spatial indicators that they seemed to be poorly understood. There was a research **recommendation** that the work on spatial indicators conducted by the Fisheries Management Working Group be expanded to better understand the interaction between the various spatial techniques. It was also suggested that this work be presented in a stand-alone publication rather than in the minutes of the Fisheries Management Working Group.

Trafffic Lights

RAP **recommended** made that a comprehensive evaluation of techniques used to roll up traffic light indicators into characteristics be conducted. Areas of evaluation should include, at a minimum, the weightings given to multiple indicators of a given variable (eg- condition factor), as well as whether or not the lights for a characteristic should 'snap to' the nearest light or not.